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A NEW SPECIES OF *NEOLASIOPTERA* FELT (DIPTERA: CECIDOMYIIDAE) ON *CUPHEA CARTHAGENENSIS* (JACQ.) MACBRIDE (LYTHRACEAE) IN BRAZIL, WITH NOTES ON ITS BIOLOGY

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Abstract.—***Neolasioptera cupheae* Gagné, n.sp.,** is described from *Cuphea carthagenensis* in Rio de Janeiro State in Brazil. It forms a multilocular, spheroid-cylindrical stem gall covered with a dense coat of glandular trichomes that exude a sticky resin. The gall occurs throughout the year, with the highest numbers in February and March, and the lowest in June. Four species of parasitoid wasps belonging to the families Eulophidae, Ceraphronidae, Eupelmidae, and Platygasteridae were obtained in low numbers from the galls.

Key Words: gall midge, stem gall, parasitoids

Cuphea, the largest genus of Lythraceae, comprises some 260 species and is a common component of the Neotropical herbaceous flora. Although many Neotropical plant genera are host to a great number of galls (Fernandes et al. 1988, Gagné 1994, Monteiro et al. 1994), only three kinds of galls are known from *Cuphea.* Two are flower bud galls that are known from Middle America and Ecuador, one formed by *Asphondylia* sp. (Diptera: Cecidomyiidae), the other by *Mompha* sp. (Lepidoptera: Momphidae) (Graham 1995). The third kind is a conspicuous stem swelling, 0.5–1.5 cm long and 0.3–1.0 cm wide, covered with resinous trichomes (Figs. 1, 2). This gall was first reported in Gagné (1994) and is formed by a new species of *Neolasioptera* Felt that is named and described here.

Cuphea carthagenensis (Jacq.) Macbride, the host of the new cecidomyiid, is herbaceous, grows to 1 m high, and is widely distributed in Brazil and elsewhere in South America. It occurs in dense clumps along roadsides in areas of lowland Atlantic forest, including the Poço das Antas Biological Reserve in the municipality of Silva Jardim, State of Rio de Janeiro, in southeastern Brazil.

The new gall midge species is placed in *Neolasioptera* by virtue of having none of the losses and modifications that would place it in any more narrowly defined genus of the tribe Alycaulini. *Neolasioptera* is a large genus of some 70 described species in the Neotropical Region and about the same number in the Nearctic Region (Gagné 1994). No key to all species is available, but these species are evidently monophagous or closely oligophagous, and distinct species may even occur on the same host species (Gagné and Boldt 1995, Plakidas 1994).

Materials and Methods

Cuphea carthagenensis was examined biweekly for the presence of galls in an area of approximately 200 m^2 (100 m × 2 m) in the Poço das Antas Biological Reserve. Surveys were also made in six other municipalities: Teresópolis, Parati, Angra dos Reis, and Guapimirim, all in Rio de Janeiro State; Linhares, Espírito Santo; and Campinas, São Paulo. A selection of galls was collected biweekly to obtain gall makers and parasitoids. Larvae and pupae were excised from some galls, adults were reared from others, and all specimens were preserved in 70% ethanol. Some larvae and adults were mounted for microscopic study in Canada balsam, using the method outlined in Gagné (1989, 1994). In the description of the new species, anatomical terminology of the adult stage follows McAlpine et al. (1981) and that of the larval stage follows Gagné (1989). The holotype and some paratypes of the new species will be deposited in the Museu Nacional do Rio de Janeiro; the remaining paratypes are deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM). The field work was done by F.F.F. Ferraz and R. F. Monteiro, the description of the new species by R.J. Gagné.

Neolasioptera cupheae Gagné, new species

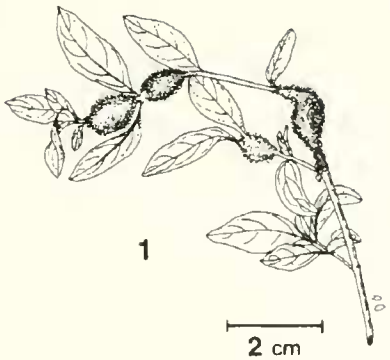
(Figs. 1–9)

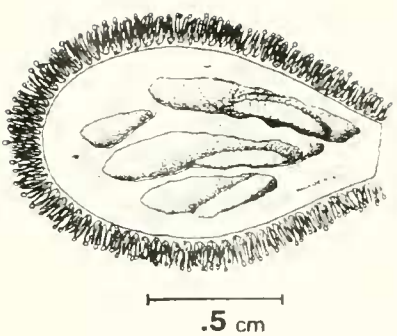
Adult.—Antenna with 12–13 flagellomeres in ♂ (n = 3), 16–17 in ♀ (n = 2). Mouthparts: labrum as wide as long; labellum semicircular in frontal view, with 7–8 lateral setae; palpus 4 segmented. Thoracic vestiture: scutum with dorsocentral and lateral rows of setae, covered elsewhere with scales except in three narrow longitudinal stripes; anepisternum with scales on dorsal half; katepisternum without scales; anepimeron with 12–14 setae and a few scales. Wing length: ♂, 1.5–1.7 mm (n = 3); ♀, 1.7–1.9 mm (n = 2). R5 about as long as half length of wing.

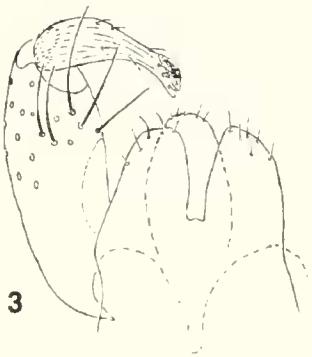
Male abdomen: First through 7th tergites rectangular, about 3 times as wide as long, with single row of sparse setae along posterior margin, a pair of trichoid sensilla on anterior margin, those on 6th and 7th tergites set anteriad of sclerotized part of tergites, and covered elsewhere with scales; 8th tergite defined only by 1–3 scales laterally and a pair of trichoid sensilla set on smooth, non-setulose area. Second through 6th sternites quadrate; 6th, 7th, and 8th sternites successively shorter, the 7th and 8th shorter than wide; all sternites with mostly single row of setae posteriorly, several lateral setae at midlength, a pair of trichoid sensilla anteriorly on all but 8th sternite, and covered elsewhere with scales. Genitalia as in Figs. 3–4: hypoproct entire, similar to cercal lobe in size, with pair of posterior setae; aedeagus approximately as long as hypoproct; gonostylus largest at base, setulose basally, striate beyond.

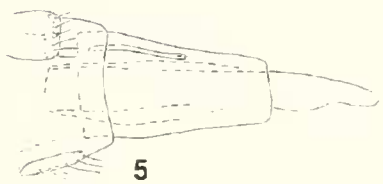
Female abdomen: First through 6th tergites rectangular, about twice as wide as long, with vestiture as in male except all trichoid sensilla situated on setulose portion of tergites; 7th tergite much smaller than sixth, barely wider than long, with posterior row of setae, anterior pair of trichoid sensilla, and scales covering only posterior half; eighth tergite divided longitudinally into two elongate sclerites, weakly sclerotized on available specimens, each of the 2 sclerites with trichoid sensillum on the broad base and several short setae anteriorly. Second to 7th sternites rectangular, with setae posteriorly, laterally, and mesally, a pair of anterior trichoid sensilla, and covered elsewhere with scales. Eighth sternite undefined. Protrusible part of ovipositor (Figs. 5, 6) of moderate length for genus, about 3 times length of 6th tergite; fused cerci elongate-cylindrical, evenly covered with setae and setulae; hypoproct elongate, narrow, with 2 apical setae.

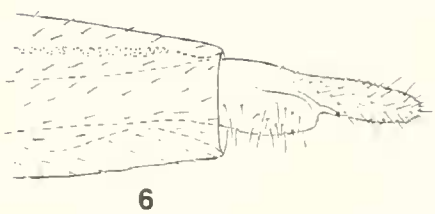
Pupa.—*Head* (Fig. 7): Antennal bases pointed apically; cervical sclerite with two elongate setae; face without ventral projections, with pair of papillae, one with seta,

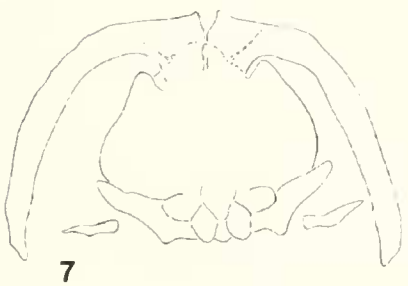


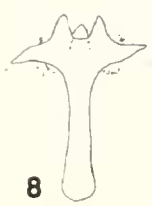


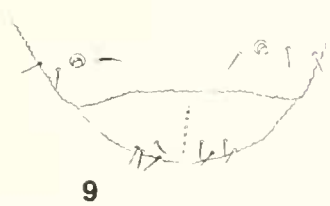












Figs. 1–9. 1, 2, Gall of *Neolasioptera cupheae* on *Cuphea carthagenensis*. 1, Branch with galls. 2, Cross-section of gall. Figs. 3–10, *Neolasioptera cupheae*. 3, Male genitalia (in part, dorsal). 4, Same (ventral). 5, Female postabdomen from 7th segment to end, inclusive (dorsolateral). 6, Detail of same beyond 8th tergite (dorsolateral). 7, Pupal head and associated structures (ventral). 8, Third larval instar spatula and associated papillae (ventral). 9, Third larval instar eighth and terminal segments (dorsal).

on each side of base of labrum. Prothoracic spiracle elongate, pointed apically. Abdominal tergites evenly covered with weak setulae.

Last larval instar. Length ca. 3 mm (n = 2). Spatula (Fig. 8) tridentate anteriorly, the middle tooth slightly shorter. Papillae: laterals 4, 2 with setae; terminals (Fig. 9) 8, with setae of approximately equal length; otherwise as for the genus (Gagné 1994).

Specimens examined.—Holotype: ♂, ex stem swelling of *Cuphea carthagenensis*, BRAZIL, Silva Jardim, Rio de Janeiro, 25-ix-1995, E.F.Ferraz, to be deposited in the Museu Nacional do Rio de Janeiro. Other specimens, same data as holotype, 2 ♂, 2 ♀, 2 pupae, 2 pupal exuviae, 3 last larval instars, will be deposited in the Museu Nacional do Rio de Janeiro and the USNM.

Remarks.—The illustrations should serve to distinguish the new species. Noteworthy characters that in combination should serve to distinguish this species from other *Neolasioptera* species are: the extension of the gonostylus mesad of the tooth (Figs. 3, 4), the elongate cylindrical fused female cerci (Figs. 5, 6), the shape of the larval spatula (Fig. 8), and the presence of 8 terminal larval papillae.

Biological Aspects of *N. cupheae* and its Gall

The gall is first apparent at the apex of a shoot, but the shoot quickly grows beyond the gall, leaving behind a more or less cylindrical swelling encircling the stem (Fig. 1). Lateral shoots and flowers, and resulting fruit, occasionally grow from galled tissue so the galls do not appear to hinder more distal growth. Seedlings of *C. carthagenensis* may bear a single gall, but mature plants may have as many as 80. After galls become apparent, trichomes begin to grow from the surrounding surface, eventually forming a dense coat 1.0 mm thick, covered with a gummy, resinous substance that accumulates at the extremities of the trichomes (Fig. 2). Small insects can be found throughout the year stuck to the trichomes. Among the insects found there were microhymenopterans, including some specimens of *Quadrastichus* sp. and several specimens of a ceraphronid species, both parasitoids reared from the galls. This is reminiscent of another sticky gall made by an unrelated cecidomyiid on a *Machaerium* (Fabaceae), also in Brazil (Fernandes et al. 1987).

Each gall contains one to 18 chambers (avg. = 4.29; SD = 2.91; N = 62), each chamber with a single cecidomyiid larva (Fig. 2). Unlike galls of many *Neolasioptera*, the inner surface of these chambers is not lined with a fungal mycelium. Larvae in the same gall were frequently of different sizes, and some galls contained both larvae and pupae. Pupation takes place in the gall. When the adult is ready to emerge, the pupa breaks through the epidermis at the end of a tunnel previously formed by the mature larva. The pupa exits only part way out of the gall and then lodges itself there, immediately after which the adult breaks through the anterior end of the pupa. The adult took from 20 to 30 minutes to emerge from the pupa, and often several adults emerged over a period of hours from the same gall, each through a separate hole. From first notice of a slight swelling of the stem to the time adults left the galls took about 30 days.

Neolasioptera cupheae is multivoltine and is present all year with overlapping generations. The abundance and density of galls was greatest in summer (February and March) when the average of galls per plant reached 8.4 galls per plant (SD = 13.55, range = 1–87): in summer of 1995 48% of the 283 plants in the study area were galled. In winter, a local, short, dry period, galls are not as common: in winter of 1995, gall density was only 1.6 per galled plant (SD = 0.89) and only 3.7% of 133 plants had galls.

Of 140 galls kept in rearing chambers during this study, only 16 (11.4%) yielded parasitoid Hymenoptera. These parasitoids belonged, in order of decreasing numbers, to: *Quadrastichus* sp. (Eulophidae), a soli-

tary endoparasitoid; a ceraphronid, a gregarious endoparasitoid; a eupelmid, a solitary ectoparasitoid; and a platygasterid, a solitary endoparasitoid. The number of parasitoids appears to be lower than that found associated with some other gall midges (Fernandes et al. 1987, Hawkins and Goeden 1984). It is possible that the resin-covered trichomes covering the galls affect the number of parasitoids in the galls.

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